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THE NATURAL HISTORY AND TAXONOMY OF *CICURINA BRYANTAE* EXLINE (ARANEAE, AGELENIDAE)

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ABSTRACT

Since its description in 1936 *Cicurina bryantae* Exline has been rarely collected. The recent discovery of the microhabitat preference of this spider has allowed the observation and collection of substantial numbers of specimens. The following account is compiled from these data. The natural history of the species is discussed (including the interesting tubular retreat constructs inhabited by immatures and adults). Both sexes are described and figured (the male for the first time).

INTRODUCTION

In 1936 Harriet Exline described a new species in the genus *Cicurina* Menge, 1869 on the basis of female specimens collected at Newfound Gap on the Tennessee-North Carolina border in 1930 by Nathan Banks. She named the species *bryantae* in honor of Elizabeth Bangs Bryant who was at that time working at the Museum of Comparative Zoology where the specimens were deposited. Since that date, *Cicurina bryantae* has rarely been collected, its behavior and life history have not been recorded, and the male has not been described.

Chamberlin and Ivie (1940) redescribed the female and mentioned two more females captured by Ivie in 1933 in East Tennessee. Apparently no other specimens were collected until 1972 when J. O. Howell found an undescribed *Cicurina* male in a pitfall trap set in Union County, Georgia. Vincent Roth tentatively identified it as the male of *C. bryantae* but no effort was made to describe it at that time as no other males were found (Howell 1972, pers. comm.).

During the late fall of 1982 I began finding populations of *C. bryantae* living within a fairly specific microhabitat in and around Jackson County, North Carolina. From then until January 1984 substantial numbers of males, females and immatures were observed and collected. The resultant data are presented in this paper; both sexes are described and figured (the male for the first time) and a general account is given of the life history. Specimens collected during this study have been deposited in the American Museum of Natural History (AMNH), Dr. N. I. Platnick; the Museum of Comparative Zoology (MCZ), Dr. H. W. Levi; the Canadian National Collection of Insects, Arachnids and Nematodes (CNC), Dr. C. D. Dondale; and the Florida State Collection of Arthropods (FSCA), Dr. G. B. Edwards; and in my private collection (RGB).

Since my acquaintance with some agelenid taxa is limited, I have here conservatively retained the classical placement of *Cicurina* within the Agelenidae. However, I do believe that the Agelenidae as it is usually envisioned is probably a polyphyletic assemblage and tentatively concur with Lehtinen's transfer of *Cicurina* to the Dictynidae: Cicurininae (1967:222-223) as catalogued recently by Brignoli (1983:518).

NATURAL HISTORY

Specimens of *C. bryantae* have been collected at elevations of 300-1350 meters (1000 to 4400 ft.) above sea level in the Blue Ridge and Great Smoky Mountain regions of the Southern Appalachians (Fig. 6). The true southern and south lateral boundaries of its range probably correspond closely to the southerly collection locales. The more northerly limits of its range are not known because of a lack of collection data from northwestern North Carolina and adjacent areas of Tennessee. It is possible that this spider ranges well into the Appalachians of Virginia.

Populations are most common in mixed deciduous forests (dominated by oak, hickory and tulip poplar) and are encountered less frequently in deciduous woods mixed with conifers such as white pine and hemlock. Within a suitable wooded habitat *C. bryantae* is usually found within retreats constructed on the undersurface of rotting wood well settled in the leaf litter of the forest floor. Retreats are never found on substrates other than rotting wood. Gryllacridid crickets, cryptocercid roaches and large numbers of collembolans as well as spiders of the genera *Antrodiaetus, Calymmaria, Coras, Wadotes, Liocranoides* and other species of *Cicurina* commonly occupy the same microhabitat as *C. bryantae.* Unidentified pseudoscorpions have been collected from otherwise empty retreats.

Eugène Simon (1898:265) observed that *Cicurina cicurea* (Fabricius) "file une toile très légère et horizontale, sous les pierres ou au milieu des mousses. . ." (Spins a very slight and horizontal web, beneath stones or within mosses. . .). Exline (1936) reported that the delicate webs of *Cicurina* species can be found in rotting logs or under rocks or boards and that no retreat is built. Although the observations of Simon and Exline may apply to most species of *Cicurina, C. bryantae* is an exception; it builds no fine horizontal sheet web but does construct an interesting retreat (Figs. 7, 8).

The retreats are built in natural cavities on suitable wood surfaces or wherever there is sufficient space between the wood and the ground. The retreat is a tube with twin, often turret-like openings at either end. The tube consists of very fine and delicate silk coated on the outside with organic debris derived from the rotting substrate or the ground beneath. The wooden substrate forms the ceiling of the retreat and is covered only lightly with silk. The openings normally point downwards and are never closed by the spider as are the similar appearing (although normally larger) entrances to the subterranean burrows of *Antrodiaetus* spiders (see Coyle 1971). The turrets are often connected to the surrounding substrate with short silk threads which may possibly function as trip wires to aid in the detection of prey.

Males, females and immatures build retreats similar in all respects except size, although male retreats occasionally exhibit a slight but pronounced lateral widening between the twin openings. Adults of both sexes occupy retreats measuring 12 to 15 mm between the inner edges of the openings (Fig. 8). Immatures build retreats (Fig. 7) ranging from about 2 mm in length (as measured above) to adult size. It is not known whether immatures

expand their retreats as they grow or simply move out and construct new larger retreats. A number of adult and immature-sized retreats can often be found in close proximity.

In an effort to observe aspects of their behavior I placed five females in an observation chamber containing a piece of rotting wood. Five others were placed in a similar chamber with a clean, unrotted piece of wood. The atmosphere was kept humid and there were ample suitable sites for retreat construction in both chambers. Overnight, spiders in the first group all built retreats on the undersurface or sides of the rotting wood. These retreats seemed quite typical although they lacked turrets and were rather sparsely coated with debris. Over a period of weeks these spiders successfully maintained themselves on a diet of cricket nymphs. The spiders of the second group built no retreats or obvious webbing of any kind and did not feed on the cricket nymphs which were introduced into the chamber. It seems evident from this that the presence of a suitable substrate and/or debris particles is a necessary prerequisite to normal retreat construction and prey capture.

Cicurina bryantae retreats are remarkably similar to those built by several species of Japanese cavernicolous cybaeinine agelenids (Komatsu 1961). Komatsu describes the cybaeinine retreats as being pipe-like in construction and usually coated with sand grains. The openings lie at the extreme ends of the tubes rather than at right angles to the tube axis, as do the entrances to the retreats of *C. bryantae.* From each opening a pair of long silk tripwires extends to the surrounding substrate. Some retreats may have as many as three openings. The retreats are encountered in open locations within caves but insofar as these areas are dark and of relatively constant humidity, they resemble the dwelling sites of *C. bryantae.*

Immatures and adult females of *C. bryantae* can be collected year round, but adult males have been collected only from late August to late January suggesting that mating occurs in the fall. Additional support for this idea is the observation that females collected during the fall, winter and early spring often have one or both passages leading from the copulatory opening blocked with what is apparently a copulatory plug of unknown composition.

Females begin producing egg cases in late spring (May). These flattened lenticular structures are composed of two silken half shells and are attached to the inner surface of the ventral-most wall of the retreat. Cases typically are filled with from three to ten eggs, each roughly spherical and approximately 0.9 mm in diameter. As the summer progresses additional egg cases are constructed and attached to any already present. Normally each succeeding egg case will have fewer eggs than its predecessor. One retreat, examined in early October 1983, contained nine egg cases in a stratified lump coated with substrate debris. Eggs in five of these had already hatched and the spiderlings had dispersed. Two contained small numbers of spider nymphs and two were parasitized. No eggs were present in any of these cases. Out of a total of 43 egg cases examined during 1983, four were parasitized. In each of these four cases a single ichneumon wasp pupa (*Gelis* sp.) was found.

Dispersal of the immatures from the maternal retreat commences during the summer. Since very small retreats are commonly found in late summer clustered near the retreats of adults, it is likely that most spiderlings simply leave the mother's retreat and build their own retreats at the first suitable location they come upon. Often these immature constructs will be built upon the surface of the presumed parental retreat (which may or may not be occupied).

Observations made over 16 months of study of *C. bryantae* populations suggest that there may be a two year or longer life cycle involved. Maturation may occur when the spiders are one year old (teneral adults have been collected regularly and only in the late summer and early fall) but there is a strong possibility that the immatures take more than one year to reach maturity as a wide range of sizes of immature retreats may be observed at any one point in time.

That a female may pass more than one winter as an adult is intimated by the collection in the early spring of 1983 of a female from a retreat containing three empty egg cases. This capture was made at a high altitude (1350 m) and sometime before any new egg cases for that year had been observed. The presence of a plug in only one of the two copulatory tubes of some females collected with egg cases suggests that if females are capable of surviving to a second breeding season, they may be able to mate again successfully.

TAXONOMY

Methods.—All measurements and counts were made with a Leitz stereomicroscope fitted with 10x eyepieces and a micrometer reticle. Measurements are accurate to 0.025 mm. Abbreviations are as follows: CL, carapace length; CW, carapace width; SL, sternum length; SW, sternum width; ALE, anterior lateral eyes; AME, anterior median eyes; PLE, posterior lateral eyes; PME, posterior median eyes; MOQ, median ocular quadrangle. Statistics are presented as follows: sample range (mean ± standard deviation). All measurements are in millimeters.

Macroseta counts for all legs are presented either literally or through the use of a standard macroseta formula where for a particular face of a leg segment a series of three numbers separated by hyphens represents the number of macrosetae on the proximal, medial, and distal portions respectively.

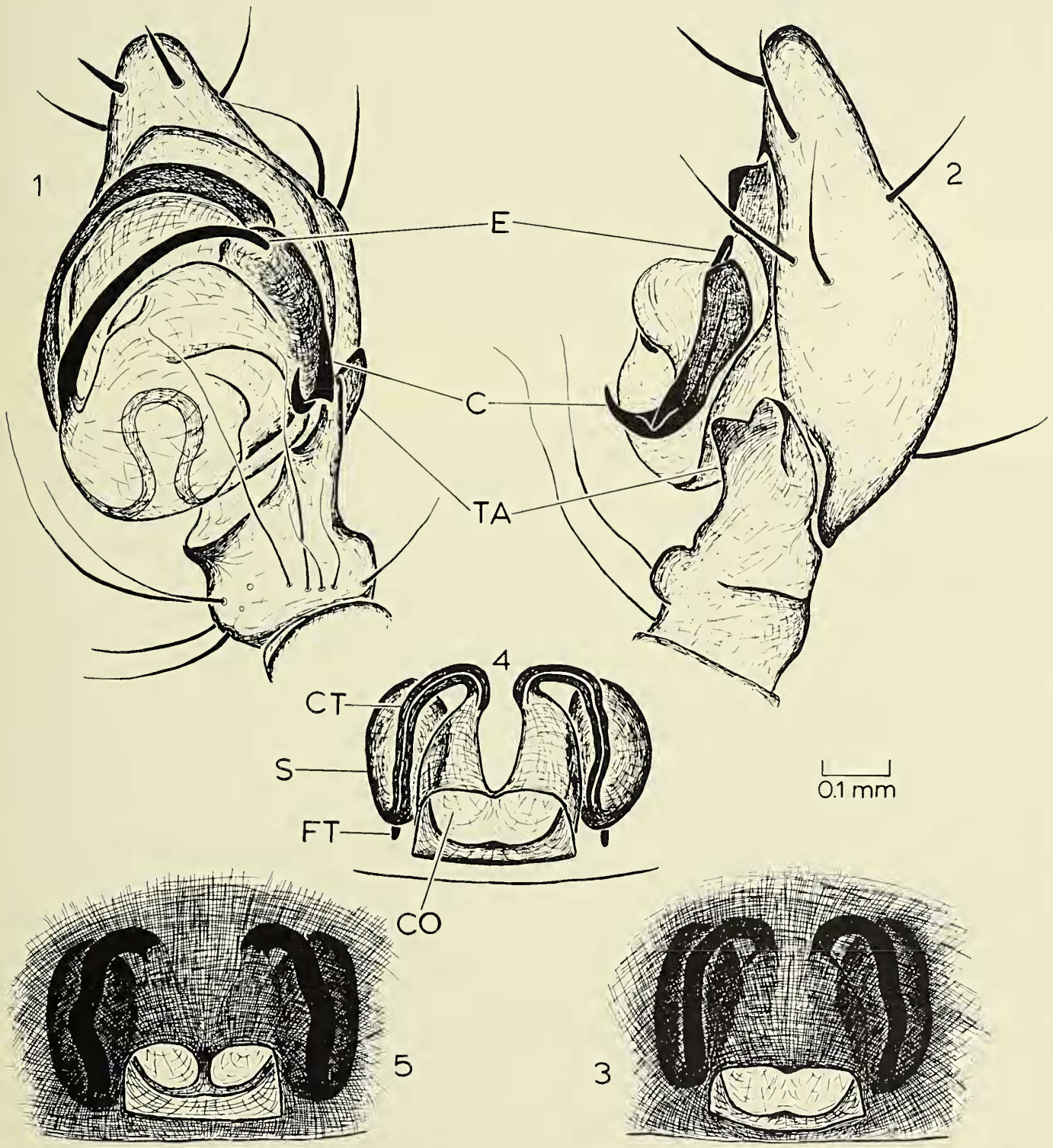
A 10x10 squared grid reticle and 16x Zeiss wide field eyepieces were used with the Leitz stereomicroscope to make drawings. Male palps were examined and drawn whole in 80% ethanol. Epigyna were treated likewise and also dissected out of the abdomen and cleared in clove oil or hot 10% KOH for study and drawing internal sclerotized characters.

Cicurina bryantae Exline
Figs. 1-11

Cicurina bryantae Exline 1936:13, figs. 4, 14 [female holotype from Newfound Gap on the Tennessee (Sevier County)-North Carolina (Swain County) border, 9 July 1933 (W. Ivie), in MCZ, examined]; Chamberlin and Ivie 1940:25, fig. 12; Bonnet 1956:1087.

Diagnosis.—Specimens of *C. bryantae* can be separated from the morphologically similar species *Cicurina pallida* Keyserling and *Cicurina breviaria* Bishop and Crosby, and from all other species of *Cicurina,* by the following series of characters: abdomen and cephalothorax unmarked; copulatory tubes smoothly curving to slightly sinuous and leading to undivided spermathecae (Figs. 3-5); embolus short and thick, terminating bluntly on distal end of short conductor; conductor with small retrolateral accessory projection originating from base of hook (Figs. 1, 2); distal retrolateral tibial apophysis short, shallowly bifurcate distally and slightly cupped dorsally.

Description.–Small to medium size spiders. Sexes similar morphologically except for sexual characteristics; males slightly larger than females. Cephalothorax and legs uniform light reddish brown (darkening with age), with dark longitudinal streak demarking position of thoracic groove. Carapace glabrous except for a few lines of sparse setae radiating from thoracic groove primarily towards and around eye region. Abdomen light colored, unmarked and lightly clothed with short setae. Chelicerae robust, each with single strong macroseta dorsally on prolateral face (Fig. 9). Retromargin of cheliceral fang furrow with 3 or 4 teeth and 2 to 5 denticles; promargin with 3 or occasionally 2 teeth. Sternum approximately as wide as long, roughly heart-shaped, with short projection extending between hind coxae. Colulus indicated by 2 to 4 setae. Spinnerets closely grouped, with



Figs. 1-5.–Genitalia of *Cicurina bryantae* Exline; 1, left palpal tibia and tarsus of male, ventral view, specimen from Cane Creek, Cullowhee; 2, same, retrolateral view; 3, epigynum, ventral view, specimen from Cane Creek, Cullowhee; 4, same cleared to show internal sclerotization; 5, variation of epigynum, ventral view, specimen from Cataloochee Valley. Abbreviations: C, conductor; E, embolus; TA, tibial apophysis; CO, copulatory opening; CT, copulatory tube; S, spermatheca; FT, fertilization tube.

median pair smallest; anterior pair close together and relatively stout; posterior pair longer, thinner and more widely spaced than anterior spinnerets. AME alone dark, others light (Fig. 9). AME smallest, slightly smaller than PME. PLE largest but only slightly larger than ALE. MOQ wider behind and slightly higher than wide. Height of MOQ about 1.5 times height of clypeus. Legs with numerous macrosetae. All femora with 3 macrosetae dorsally along midline, with a pair of lateral macrosetae bracketing the terminal dorsal macroseta except for femur I which normally bears a retrolateral pair of offset macrosetae distally. Ventrally on all femora a double row of relatively small thin macrosetae, ventral retrolateral row heavier than ventral prolateral row, and macrosetae decreasing in size to status of setae from femur I to femur IV. Macrosetation of tibia I and metatarsus I complicated and somewhat variable (Figs. 10-11). Tibia I normally with row of 5 macrosetae originating on ventral prolateral surface and terminating prolaterally; two other macrosetae along ventral retrolateral surface and a pair of small macrosetae distally on ventral surface; one additional macroseta prolaterally above second and third ventral prolateral macrosetae; dorsally one small macroseta near proximal end. Ventral surface of metatarsus I with similar macroseta pattern but three macrosetae each on prolateral, ventral prolateral and ventral retrolateral surfaces. Tibia II 2-2-2 ventrally, with distal pair of macrosetae and ventral prolaterals reduced; prolaterally two strong macrosetae; two weak macrosetae dorsally. Metatarsus II 2-2-3 ventrally and 3 macrosetae along prolateral surface. Tibia III 2-2-2 or 1-2-2 ventrally, and two macrosetae each on prolateral, retrolateral and dorsal surfaces. Metatarsus III 2-2-3 ventrally, one macroseta each on prolateral and retrolateral faces and 2-2-2 dorsally with the median pair staggered. Tibia IV normally 1-2-2 ventrally, otherwise similar to tibia III. Metatarsus IV 2-2-1 ventrally, with 2 macrosetae on retrolateral surface and 2-2-2 dorsally. Metatarsal and tarsal trichobothria patterns typical, arranged in single longitudinal row dorsally and increasing in length distally along both segments on each leg. Tarsi and metatarsi each with 4 or 5 trichobothria; metatarsi II and III often with 4 and metatarsi I and IV with 5. Legs arranged in order of decreasing length: IV-I-II-III.

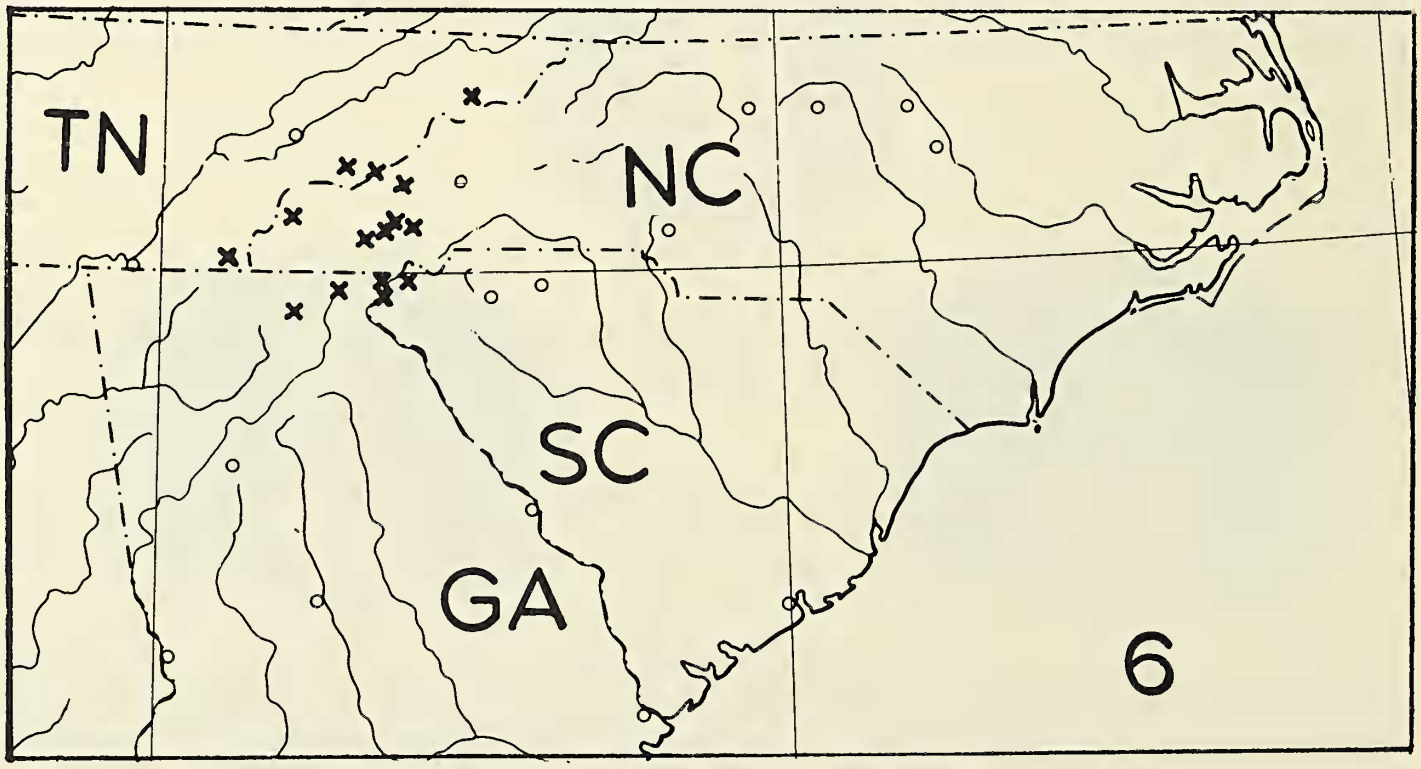
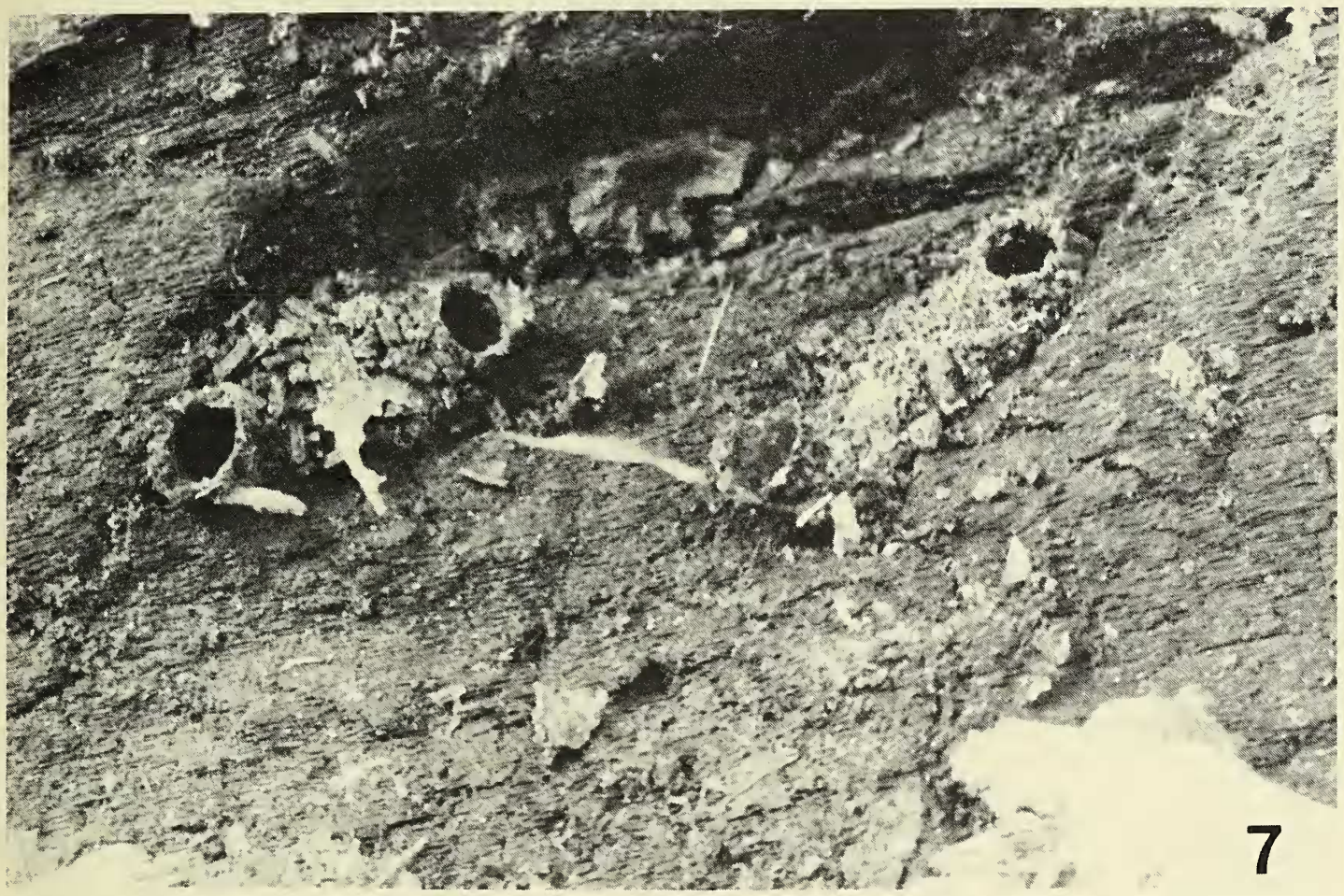


Fig. 6.–Known geographic distribution of *C. bryantae.*



Figs. 7-8.–Retreats of *C. bryantae,* specimens from Cullowhee: 7, retreats of immature specimens, both approximately 5 mm between inner edges of entrances. Lower entrance of right hand burrow blurred due to momentary presence of occupant in entrance during time exposure; 8, retreat, 12 mm between inner edges of entrances, with mature female at one entrance.

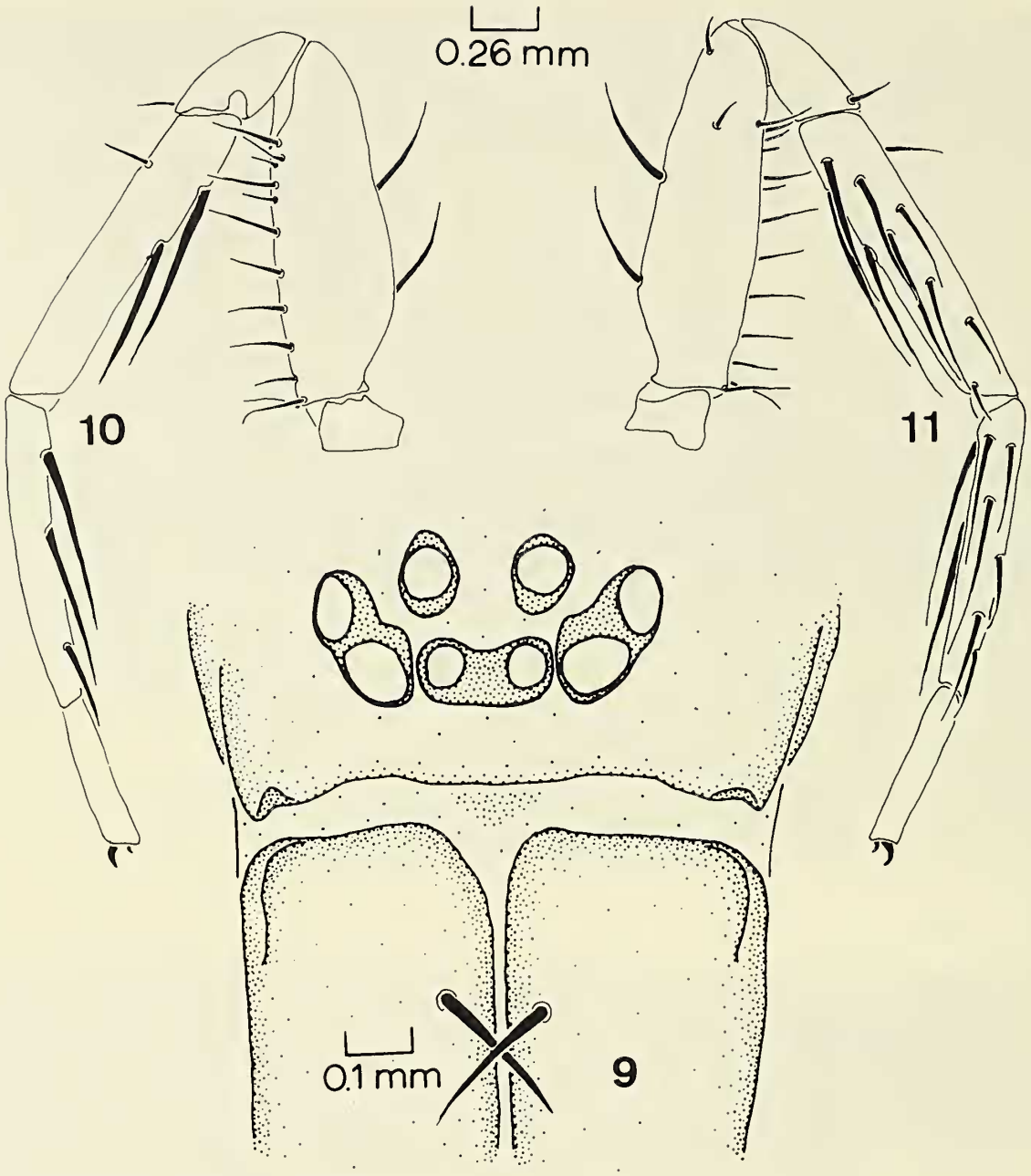


Fig. 9—Frontal view of eyes and cheliceral bases of *C. bryantae.*
Figs. 10-11.—Left leg I of male, 10, retrolateral aspect; 11, prolateral aspect.

Male: Figs. 1, 2. 26 specimens measured. CL 1.78-2.45 (2.09 ± 0.16), CW 1.38-1.73 (1.57 ± 0.11), SL 0.88-1.1 (0.99 ± 0.06), SW 0.85-1.08 (0.96 ± 0.06). Palpus very simple in comparison to most *Cicurina* males. Cymbium short and stubby. Terminal conductor hook short and smoothly curved ventrally. Other characters as in diagnosis.

Female: Figs. 3-5. 30 specimens measured. CL 1.73-2.35 (2.06 ±0.17), CW 1.25-1.63 (1.45 ± 0.12), SL 0.8-1.08 (0.97 ± 0.07), SW 0.83-1.03 (0.92 ± 0.07). Epigynum very simple. Copulatory opening usually appearing single and dividing into two funnel shaped bursae just inside opening (Figs. 3, 4). In some specimens, particularly those from the Cataloochee Valley, Haywood County, North Carolina, the copulatory opening itself appears to be divided (Fig. 5). This is because the internal division into the pair of bursae is more ventrally placed within the mouth of the copulatory opening. (No concommitant variation has been detected in males from the Cataloochee Valley.) A single, short sclerotized fertilization tube exits each spermatheca dorsocaudally and proceeds for a short distance anteriorly and dorsally in a tight arch before sclerotization becomes weak and tubes become invisible. Copulatory tubes thick-walled with a thin canal visible within. Other characters as in diagnosis.

Specimens examined.–(Collected by author unless otherwise noted.) U.S.A.: GEORGIA; *Rabun County,* W of Chatooga R. on Highway 708, 11 January 1984, 1 male, 1 female (FSCA), intersec. of St. Rds. 76 and 197, 12 miles W of Clayton (2160 ft.), 12 January 1984, 3 males, 8 females, 4 immatures (AMNH); *Union County,* Vogel St. Pk. (2750 ft.), 17 January 1972 (J. O. Howell), 1 male (JOH), south end of Vogel St. Pk. (2300 ft.), 12 January 1984, 4 immatures (FSCA); *White County,* Unicoi St. Pk., Ana Ruby Falls (1800 ft.), 12 January 1984, 2 females (FSCA). NORTH CAROLINA: *Graham County,* Stratton Meadows (4400 ft.), 4 April 1983, 5 females, 5 immatures (MCZ); *Haywood County,* Pinnacle Ridge, Blue Ridge Parkway (4400 ft.), 31 May 1983, 1 female (AMNH), Great Smoky Mtn. Nat. Pk., Cataloochee Valley (2700-3200 ft.), 7-9 October 1983, Caldwell Fork, 1 male (MCZ), near Caldwell House, 2 males, 1 female (AMNH), above Rough Fork, 2 males, 7 females (FSCA), above Beech Grove school, 4 males, 6 females (RGB), Hannah Cabin, 2 males, 4 females (MCZ), near Palmer Cemetery, 1 male, 4 females (AMNH); *Jackson County,* N slope Little Panther Knob, Long Branch Rd., Cullowhee (2600 ft.), 5 November 1982, 1 male, 9 females, 16 immatures (AMNH), 17 May 1983, 3 females, 3 immatures (AMNH), Cane Creek Valley, Cullowhee (2200-3200 ft.), 7 November 1982, 2 males, 11 females, 9 immatures (MCZ), 31 December 1982, 1 female (RGB), 15 March 1983, 3 females (RGB), 16 June 1983, 5 females, 3 immatures (RGB), 25 August 1983, 4 females, 1 immature male, 1 immature (AMNH), 5 September 1983, 1 female (MCZ), 13 September 1983, 4 males, 10 females, 2 immatures (MCZ), 30 September 1983, 2 females (FSCA), 19 October 1983, 5 males, 8 females (RGB), Owens Gap, intersec. of Co. Rd. 1763 and Highway 281 (3600 ft.), 22 November 1982, 1 male, 3 females (FSCA), Tuckaseegee River at 40 mile bend, Cullowhee (2050 ft.), 30 September 1983, 6 males, 10 females, 4 immatures (MCZ), Fall Cliff, WCU Preserve, Cullowhee Mtn. Rd., 4 July 1983, 4 females, 1 immature male, 6 immatures (MCZ), Mull Creek, Cullowhee (3000 ft.), 27 August 1983, 1 female (MCZ), 5 September 1983, 1 male (MCZ), Webster, Morgan Farm, 27 April 1983, 3 females, 1 immature (FSCA); *Swain County,* Newfound Gap near Cherokee, 3 August 1930 (N. Banks), 1 female (MCZ). SOUTH CAROLINA: *Oconee County,* N side of Highway 76 at Chatooga River (1240 ft.), 11 January 1984, 4 immatures (FSCA). TENNESSEE: *Polk County,* Goforth Creek at Highway 64 (1000 ft.), 1 female (AMNH); Sevier County, Laurel Falls Trail, Little River Rd., Great Smoky Mtn. Nat. Pk., 8 May 1983, 1 female, 1 immature (MCZ).

Additional Records.–TENNESSEE: *Unicoi County,* Erwin, 8 July 1933, (W. Ivie), 1 female; *Sevier County,* Little Pigeon Creek, Great Smoky Mtns., 9 July 1933, (W. Ivie), 1 female.

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